



United States
Department of
Agriculture

Forest Service

Pacific Northwest
Research Station

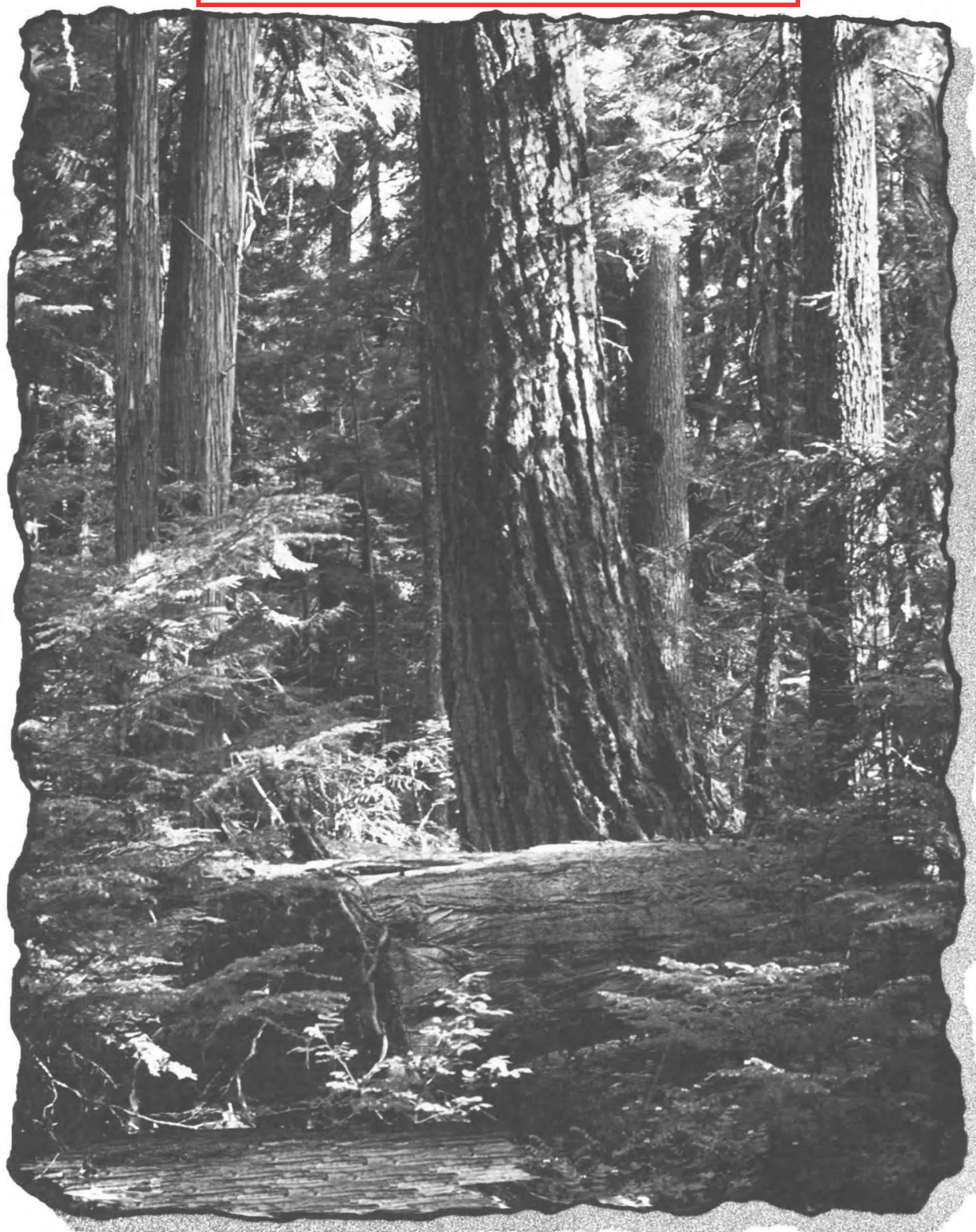
Resource Bulletin
PNW-RB-197
December 1993



Area of Old-Growth Forests in California, Oregon, and Washington

Charles L. Bolsinger and Karen L. Waddell

This file was created by scanning the printed publication.
Text errors identified by the software have been corrected;
however, some errors may remain.



Authors

CHARLES L. BOLSINGER and KAREN L. WADDELL are research foresters,
Forestry Sciences Laboratory, P.O. Box 3890, Portland, OR 97208-3890.

Abstract

Bolsinger, Charles L.; Waddell, Karen L. 1993. Area of old-growth forests in California, Oregon, and Washington. Resour. Bull. PNW-RB-197. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 26 p.

Area of old-growth forests in California, Oregon, and Washington has declined significantly in the second half of the 20th century. This report summarizes available information on old-growth forest area by ownership in California, Oregon, and Washington. Old-growth definitions used by the various owners and agencies are provided.

Keywords: Old growth, inventory, forest stands, forest area, California, Oregon, Washington.

Summary

Old-growth forests in California, Oregon, and Washington cover about 10.3 million acres. Estimates were obtained for National Forests, national parks, state parks, state forests, Bureau of Land Management land, U.S. Fish and Wildlife Service land, Native American land, and private ownerships. Oregon has almost half of the old-growth acres with about 5 million acres in seven different ownerships. More than 80 percent of the old-growth is on Federal land, primarily National Forests. Old-growth occupied about half of the forest area when the first comprehensive forest surveys were made in the 1930s and 1940s. Less than 20 percent of the forest area is now old-growth.

Preface

Forest inventories are authorized by the Forest and Rangeland Renewable Resources Research Act of 1978. Work units located at USDA Forest Service Research and Experiment Stations conduct forest resource inventories throughout the 50 states. The Inventory and Economics Research and Development Program of the Pacific Northwest Research Station at Portland, Oregon, is responsible for these inventories in Alaska, California, Hawaii, Oregon, and Washington.

Contents

1	Introduction
2	Highlights
3	Characteristics of Old-Growth Forests
4	Ownership of Old-Growth Forests
7	Classification of Old Growth In Early Surveys
7	Old-Growth Definitions and Procedures
8	National Forests
9	National Parks
9	Bureau of Land Management
9	U.S. Fish and Wildlife Service
9	State Parks
9	State Forests
10	California State Lands Commission
10	Private—Native American
10	Other Private
11	Old-Growth Area Tables
23	Terminology
24	Names of Trees
24	Acknowledgments
25	Literature Cited

Table 1—Productive forest land and old-growth forest area in California, Oregon, and Washington, 1933 to 1945 and 1992

Table 2—Area of old-growth forests by ownership in California, Oregon, and Washington, 1992

Table 3—Area of old-growth forests on reserved and unreserved lands by State and owner in California, Oregon, and Washington, 1992

Table 4—Area of old-growth forests on reserved and unreserved land by owner and State in California, Oregon, and Washington, 1992

Table 5—Area of old-growth forests on reserved and unreserved lands in National Forests by State and National Forest in California, Oregon, and Washington, 1992

Table 6—Area of old-growth forests on reserved and unreserved lands managed by the National Park Service, by State and national park in California, Oregon, and Washington, 1992

Table 7—Area of old-growth forests on reserved and unreserved lands in State parks by State and resource area or county, California, Oregon, and Washington, 1992

Table 8—Area of old-growth forests on reserved and unreserved land in State forests, California and Washington, 1992

Table 9—Area of old-growth forests on reserved and unreserved privately owned lands (exclusive of Native American land) by State, California, Oregon, and Washington, 1992

Table 10—Area of reserved and unreserved old-growth forests on lands managed by the Bureau of Land Management by State and county or district, California and Oregon, 1992

Introduction

The vegetation of the Pacific States has changed profoundly during the past several thousand years, primarily in response to changes in climate. Within the past 250 to 300 years, however, human activity has been the major cause of change in vegetation across the landscape. In California, for example, annual grasses and forbs introduced by the Spanish in the mid-to-late 1700s replaced native perennial bunch grasses across millions of acres. Between 1848 and 1920, when the population of California increased from 15,000 to 4 million, many events occurred that affected landscape characteristics and directly or indirectly influenced forest vegetation. Such events include the gold rush, development of irrigated agriculture and attendant construction of reservoirs and canals, building of major cities, depletion of range by overgrazing of cattle and sheep, completion of transcontinental railroads, and the beginning of the real estate boom in the Los Angeles basin. In Oregon and Washington, similar activities occurred on a smaller scale and changed landscape features in the Puget Sound basin, the Willamette Valley, and the range lands east of the Cascade Range (Barbour and Major 1977, Brubaker 1991, Hansen 1946, Schofield 1969).

Around 1900, the establishment of forest reserves—later to become National Forests—and national parks temporarily slowed the rate of landscape change in many forested areas. The primary causes of change during that time were large forest fires and insect and disease epidemics. After World War II, increasing demand for forest products and other natural resources resulted in road building, timber harvesting, and other activities in vast areas of previously untouched forest. These events continue to change the landscape today. At lower elevations, a significant factor reshaping the landscape has been the parceling of ownership tracts, and the subsequent treatment of the land by the different owners (fig. 1).

Timber harvesting and land ownership division have affected millions of acres of forest. Most of the area logged is still forest, either because new trees have replaced those that were cut, or enough trees remained after logging to constitute a forest stand. Although the total forest area was not greatly reduced, the character of the forested landscape changed dramatically.

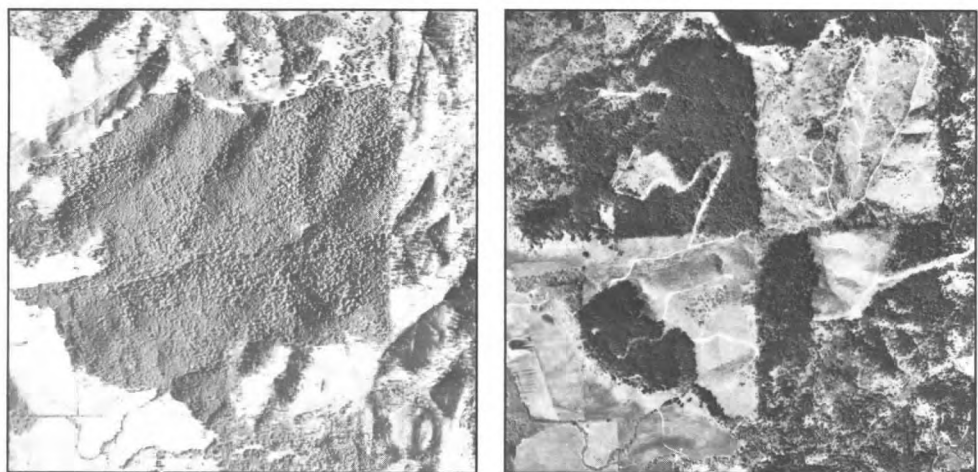


Figure 1—Changing forest landscape resulting from ownership parceling and land use activities. These aerial photographs taken in 1960 and 1982, show changes on about 3,500 acres in western Oregon. Ownership of the area shown includes timber companies, farmers, and the Federal Government.

Today's landscape in many areas is one of small patches of trees of different ages interspersed with recently logged areas. At lower elevations, forests are intermingled with farms, pastures, towns, and reservoirs. The forest patchwork is further fragmented by highways, railroads, canals, powerlines, pipelines, and an increase in "ex-urban" residential developments and single residences.

Before settlement, disturbances severe enough to destroy forest canopies occurred at widely spaced intervals and affected large areas. The result was extensive areas of homogeneous forests. At any given time, a relatively high proportion of these forests consisted of old trees. The range of forest conditions that early explorers and settlers saw—from denuded areas to old-growth—still exist. Today, however, a much smaller proportion of the forest is old-growth, and the old-growth stands generally are on small and scattered parcels. As the area of old growth has decreased, awareness of the value of old growth has intensified. Land and resource managers, scientists, educators, and members of the public are debating the old-growth "issue." Concerns about old growth include wildlife habitat, genetic reserves, timber supply, carbon sequestration, nutrient cycling, medicinal plants, climate change, and many more (Franklin and others 1981, Haynes 1986, Holthausen and Marcot 1991, Thomas 1979, Tyrell 1991).

Essential to those involved in old-growth policy questions is a sound information base. This publication presents the most current estimates of area of old-growth forests in California, Oregon, and Washington. This information includes both measured and estimated data provided by representatives from various land management organizations and statistics developed from resource data at the Pacific Northwest Research Station (Ohmann 1992).

The amount of forest that existed before the arrival of Europeans, and how much of it was old growth are unknown. The first systematic inventory of forests on the Pacific Coast was completed in the mid-1930s, after passage of the McSweeney-McNary Forest Research Act of 1928. In part, the act called for periodic surveys of the Nation's forests. Inventories conducted since 1930 indicate that the total area of productive forest in California, Oregon, and Washington has decreased from about 66 million to 63 million acres, or about 4.5 percent. The major causes of the decrease in forest area were construction of roads, reservoirs, powerlines, and clearing for urban expansion and agriculture (Bolsinger 1973, 1980; MacLean 1990; MacLean and others 1992; USDA Forest Service 1989).

The earliest forest inventories in California, Oregon, and Washington, completed in 1933 to 1945, show a total area of 32.8 million acres of old-growth forest on productive forest land (table 1). The current information shows old-growth forests now amount to about 10.3 million acres. Although, as explained below, there was no single objective or set of criteria for classifying old growth for either period, these estimates provide a basis for evaluating change in old-growth area (see "Old-Growth Definitions and Procedures," p. 7).

The current estimate of 10.3 million acres of old growth applies to a total area of 56.6 million acres of productive forest in California, Oregon, and Washington (table 1). This is about 90 percent of the total reserved and unreserved productive forest area—63.1 million acres—in the three-state area (see "Terminology," p. 23). The area of old growth on the remaining 10 percent—6.5 million acres of National Forests in the southern Cascades, the Sierra Nevada, and the southern California mountains—has not been determined. Old growth amounted to 49 percent of the total forest area in the early surveys, compared with 18 percent now, as shown in table 1.

Highlights

Productive Forest Decline—3 Million Acres In Five Decades

Old-growth Declined by Two-Thirds In Five Decades

Table 1--Productive forest land and old-growth forest area in California, Oregon, and Washington, 1933 to 1945 and 1992

State	1933 to 1945			1992 ^b		
	Productive forest	Old growth	Percent ^a	Productive forest	Old growth	Percent ^a
	--Million acres--		- % -	--Million acres--		- % -
California	17.1	9.5	55.6	13.1 ^c	2.5 ^d	19.1
Oregon	26.7	14.2	53.2	23.9	4.9	20.5
Washington	22.7	9.1	40.1	19.6	2.8	14.3
Total	66.5	32.8	49.3	56.6 ^c	10.3 ^d	18.2

^a Percentage of total productive forest land (in a state) that contains old-growth stands.

^b The date of compilation is 1992. Actual dates of classification range from the early 1980s to 1992.

^c Excludes 6.5 million acres of productive forest in National Forests in the southern Cascades, Sierra Nevada, and southern California where old growth has not been surveyed.

^d Excludes an unknown acreage of old growth on the 6.5 million acres of productive forest in the southern Cascades, Sierra Nevada, and southern California where old growth has not been surveyed.

Characteristics of Old-growth Forests

The main focus of the old-growth debate has been on the Douglas-fir¹ and redwood forests within the maritime influence in northwestern California, western Oregon, and western Washington. The largest and most impressive of the Douglas-fir forests generally were below 2,000 feet in elevation on level benches and gently sloping hillsides. Most of the forest land at these lower elevations is in private ownership, and most of the privately owned old growth has been logged, usually by clearcutting. Some areas have been clearcut twice, and the land is now occupied by the third generation of forest since settlement.

¹ The scientific names are shown in the "Names of Trees" section, p. 24

Older second-growth stands on land logged or burned in the late 1800s to early 1900s are approaching old growth in size. Such large second-growth stands generally lack the characteristics of old growth, which are (1) storied canopy including different tree species in the lower levels (fig. 2a), (2) openings that allow light into the forest floor where dense vegetation thrives, (3) presence of snags, (4) coarse woody debris on the ground (fig. 2, c and d), and (5) the absence of major stand-altering disturbance by humans (Franklin and others 1981, Marcot and others 1991).

In western Oregon, a small acreage of low-elevation old-growth Douglas-fir forest exists on lands managed by the Bureau of Land Management. In addition, a few parcels of low-elevation old-growth Douglas-fir exist on private land within the redwood zone in coastal California, on Native American lands, and in parks (fig. 2). Much of the remaining old-growth Douglas-fir forest is in National Forests in southern Oregon and northwestern California, on steep terrain.

The bulk of the old-growth forest in central and northern Oregon, Washington, and California outside the coastal redwood and Douglas-fir zone is on sites where Douglas-fir often is a minor component, especially in late seral stages of stand development. In Oregon and Washington, these old-growth forests consist of mixtures or pure stands of true firs (grand fir, noble fir, Pacific silver fir, and subalpine fir), western and mountain hemlocks, Engelmann spruce, western larch, western redcedar (fig. 3), Alaska yellow-cedar, and several species of pine. In California, these old-growth forests outside the redwood zone consist of true fir (mostly white fir and California red fir) and mixed-conifer stands that are typically mixtures of true firs, Douglas-fir, sugar pine, ponderosa and Jeffrey pine, and incense-cedar (fig. 4).

Some old-growth forests, especially in southern Oregon and California, contain evergreen hardwoods such as Pacific madrone, chinquapin, live oak, tanoak, and California laurel. Deciduous hardwoods such as bigleaf maple, Oregon white oak, and California black oak also occur in old-growth forests, especially at lower elevations (see fig. 2), and in the warmer forests of southern Oregon and California.

Ownership of Old-growth Forests

Most old-growth forests are in Federal ownership, as shown in table 2. Although different ownerships have used various definitions, most old growth on Federal and State lands consists of stands containing large old trees. Some of these stands contain multilayered canopies and other characteristics of old-growth as defined by Franklin and others (1981) and the Old-Growth Definition Task Group (1986). On private lands, most of the 1,423,000 acres classified as old growth consist of stands from which old trees have been removed. Mixed-conifer stands in California make up the bulk of these forests. They have been selectively logged one to several times over the past century, but they still contain three of the four major elements of the ecological definition of old-growth forest—mature or overmature trees, multilayered canopy with several age groups represented, and snags and coarse woody material on the ground (the old-growth element lacking in these stands is the absence of major stand-altering human activities). Ironically, in some stands, human activity has promoted the development of multilayered canopies and added to the coarse woody material on the ground.

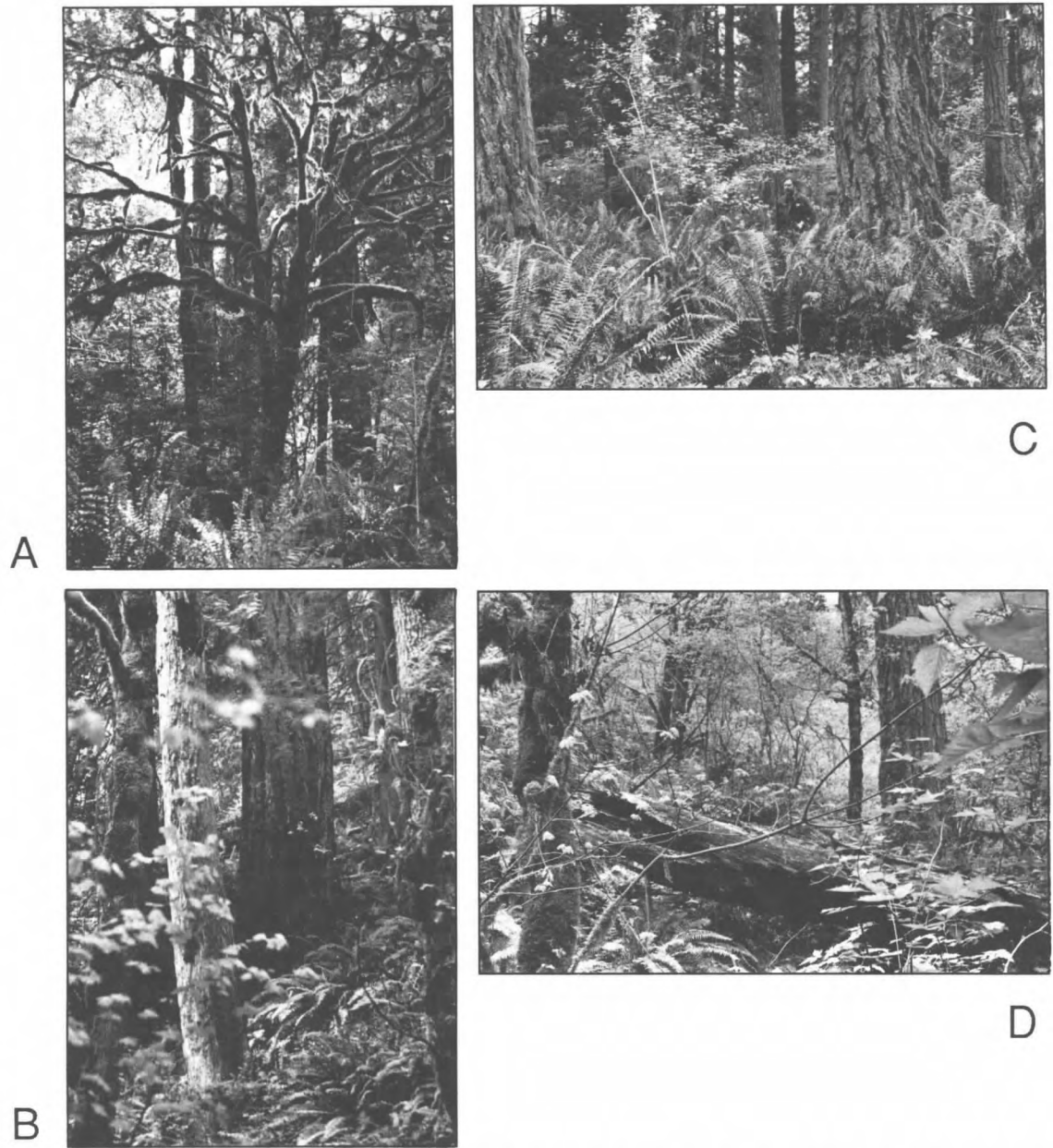


Figure 2a-d—Low-elevation old-growth forest in northwestern Oregon—four locations in the same stand showing (a) storied canopy of various tree species (Pacific yew in foreground, with bigleaf maple, western hemlock, and western redcedar in the background) and shrubs (vine maple, cascara, hazel, salmonberry, salal, and Oregon grape); (b) large dominant trees (Douglas-fir) with standing snags; (c) lush ground cover of ferns and forbs in openings created by tree mortality; and (d) snags, down trees, and logs in various stages of decay. Photographs courtesy of Don Gedney.



Figure 3—Western redcedar in a western hemlock-Pacific silver fir stand in western Washington.



Figure 4—Old-growth, mixed-conifer stand in northern California, consisting of groups of old trees (ponderosa pine in this scene) intermixed with pockets of younger trees (white fir in this scene).

Table 2--Area of old-growth forests by ownership in California, Oregon, and Washington, 1992 ^a

Ownership	Acres	Percent
Federal:		
National Forests	6,942,545	67.6
National parks	1,224,470	11.9
Bureau of Land Management	364,200	3.5
U.S. Fish and Wildlife Service	300	trace
Total, Federal land	8,531,515	83.1
State:		
State parks	95,923	.9
Other state land	73,736	.7
Total, state land	169,659	1.7
Private:		
Native American	144,868	1.4
Other private land	1,423,000	13.9
Total, private land	1,567,868	15.3
Total, all ownerships	10,269,042	100.0

^a The date of compilation is 1992. Actual dates of classification range from the early 1980s to 1992.

Classification of Old Growth in Early Surveys

The early surveys were based mostly on mapping, which classified forests as either old growth or young growth by the size and character of dominant trees. For example, large young-growth Douglas-fir trees were described as "coarse-grained timber, yielding only a small percentage of the upper grades of lumber" (Andrews and Cowlin 1940). Most other species were classified only as large or small and based strictly on bole diameter; "large" was referred to as old growth. An exception was old-growth ponderosa pine, which was defined as "large ponderosa pine, in which the predominating trees are the so-called yellow pine, about 22 inches d.b.h. [diameter at breast height] or more (about 150 or 200 years old and older), in which no material part of the stand has been cut" (Cowlin and others 1942).

Old Growth Definitions and Procedures

In this report, as in previous surveys, there is no single definition for old growth. Different forest owners and managers have used different definitions, and translating the several data sets into one with common criteria would be impossible. For some species and forest types, old-growth definitions have not been developed. In such cases, old-growth estimates were based on a simple stand-age or tree-size classification. Occasionally, these estimates were the judgment of a land manager and were based on experience and a general definition. Procedures used by the various owners and land managers to classify old-growth area are discussed in the following section. Although the definitions differ from one ownership to another, they all have one thing in common—the presence of large, old trees.

National Forests

California—Old-growth areas have been estimated only for the following National Forests whose boundaries are totally or partially within the Klamath Province of the Douglas-fir region: Klamath, Mendocino, Shasta-Trinity, and Six Rivers. Local definitions of old growth were not available when the project began; for that reason the definitions in PNW-447 (Old-Growth Definition Task Group 1986) were used. Vegetation maps were developed from color aerial photographs taken in the 1970s with a scale of 1:15,840 (4 inches to the mile). These maps were updated to account for more recent timber harvesting and fires by using 1989 satellite imagery and orthophotographs. Ranger District personnel from each National Forest made the updates on 7.5-minute quadrangles, following detailed instructions provided in workshops.

The following procedures were used for the Douglas-fir-mixed evergreen and Sierra mixed-conifer types: photo interpretive techniques along with the definitions in PNW-447 were used to identify timber stands most likely to meet the old-growth criteria. Crown size and crown closure of live conifer trees in the overstory were used if they could be classified on aerial photographs; and standing dead or down trees were used in classification only if they could be identified on aerial photographs.

Crown size and closure were used to classify old-growth stands as follows:

1. If crown diameter of overstory conifers is greater than 24 feet for trees 21 inches in d.b.h. and larger, then three size classes were identified as old growth:
 - (a) Medium timber, with a size class of 4—crown diameters are 24 to 40 feet;
 - (b) large timber, with a size class of 5—crown diameters are greater than 40 feet; and
 - (c) multistoried timber, with a size class of 6—where the crown diameter of the top story is greater than 24 feet.
2. For singlestoried medium and large timber stands, the crown closure of overstory conifers must be at least 40 percent. For multistoried timber stands, the crown closure of the top story is at least 10 percent, and the crown closure of the understory exceeds 70 percent.

The above procedures do not meet all the Old-Growth Definition Task Group (1986) criteria, which in turn does not exactly fit conditions found locally. The most limiting factors are snags and down logs, and the different mix of tree species found in California. To address the problem, local definitions are being developed for 13 forest types in California. Experts from several organizations are working on this and expect to have definitions applicable for classifying old-growth forests in the entire State by 1994.

Oregon and Washington—Information was compiled from current Forest plans. In general, old-growth stands were 250 years or older and relatively undisturbed (less than 10 percent affected by logging or other activity). A more detailed definition was applied where availability of data made it possible. The main criteria were as follows:

1. Mature and overmature trees present in the overstory.
2. Stands have a multilayered canopy with trees of several age classes.
3. Snags and down logs or trees were present.
4. Human activities have not significantly altered the stand.

Old-growth stands were at least 10 acres or larger to be included in this summary (see Marcot and others 1991).

National Parks

All states—Stands are generally 200 years or older (the actual age usually was not determined). Stands consist of multilayered canopies, show little or no sign of human disturbance, and have snags and down trees or logs present. Areas were compiled to the nearest 10 hectares (25 acres).

Bureau of Land Management

California—Area of old growth was based on computerized maps produced by photo-interpretive methods (Fox 1988).

Oregon—Stands 200 years and older were defined as old growth. In western Oregon, the area of old growth was estimated from a sample of 1-acre plots established on a grid across the landscape. In eastern Oregon, the area of old growth was estimated from a sample of 5-acre plots.

U.S. Fish and Wildlife Service

Washington—Although extensive areas of land are managed in California, Oregon, and Washington by the U.S. Fish and Wildlife Service, they are primarily nonforest—including prairies, marshes, and other wetlands. The small acreage of old-growth forest shown in the summary tables is found on Long Island in Willapa Bay, Pacific County, Washington. No definitions were given for this area.

State Parks

California—The Department of Parks and Recreation supplied information for the State parks. In the North Coast area, the extent of old growth was based on computerized maps produced by photo-interpretive methods (Fox 1988). The minimum mapping unit was 40 acres; old growth was defined as forests containing standing trees predating the arrival of European civilization. These stands contained large redwood trees estimated to have diameters greater than 24 inches and covering at least 10 percent of the area. Old-growth areas not covered by Fox (1988) were determined by the Department of Parks and Recreation ecologists and foresters using aerial photographs and field checking. For the North Coast area, old-growth stands had at least 50-percent tree canopy cover of trees at least 100 years old. For the rest of the State, old-growth stands included forest stands that had been undisturbed over the past 100 years.

Oregon—Area of old growth was compiled for the first time for this publication and was determined by using property reports along with land manager's familiarity with the tracts. An attempt was made to use the definition from Franklin and others (1981) and the Old-Growth Definition Task Group (1986) in a general way. Many of the tracts, however, consist of young growth with a substantial number of residual old-growth trees.

Washington—Information was compiled by an experienced forester, familiar with the parks. Old-growth trees were 150 years old or older. Included were stands where old growth was the dominant forest characteristic. Excluded were 35,485 acres of forests with scattered old-growth trees.

State Forests

California—The California Department of Forestry and Fire Protection provided information for the State-owned forests. Old-growth stands in the Mountain Home State Forest are composed primarily of giant sequoia forests, with trees at least 50 inches in d.b.h. Although this describes most of this State forest, the entire area has been partially logged. Trees 1,000 years and older are present in these partially cut stands. In other State forests, old-growth stands have six or more trees per acre that are 32 inches in d.b.h. or larger and 200 years old or older.

Oregon—No data were available for Oregon Department of Forestry lands, although there are some forest stands that would qualify structurally as old-growth stands but may not qualify by age.

California State Lands Commission	<p>Washington—The Department of Natural Resources defined old-growth stands as those containing trees at least 160 years old.</p>
Private—Native American	<p>An estimate of old-growth area was not available for the State Lands Commission (SLC) in California. Old growth is known to exist in small amounts in scattered tracts, mainly in Butte and Mendocino Counties.</p>
	<p>California—Old-growth stands contain four or more conifer trees per acre, at least 21 inches in diameter, and > 200 years old.</p>
	<p>Oregon—Old-growth stands contain live trees 30 inches and larger in diameter. An assumption was made that these trees were 250 years or older.</p>
	<p>Western Washington—Summaries made available were classified as “preliminary data,” based on timber inventory analysis. All densities of old growth were included. Old-growth stands have a minimum d.b.h. of 21 inches, regardless of age.</p>
	<p>Eastern Washington—Old-growth stands contain at least 15 live trees per acre that are > 21 inches in diameter, and an average of one-half snag per acre (5 in 10 acres). The definition from Thomas (1979) was followed in these forests. Trees were 160 to 215 years old depending on forest type.</p>
Other Private	<p>All estimates are based on a two-phase sample of aerial photo plots subsampled by field plots. In eastern Washington, field plots consist of 10 subplots distributed over 1 acre. In all other areas, field plots consist of five subplots distributed over an area of about 8 acres.</p>
	<p>California—Even-aged stands 200 years and older and uneven-aged stands in which the plurality of stocking is in trees 100 years and older are classified as old-growth. Most of the forests on private land shown as old growth in this report consist of residual stands selectively logged one or more times. Data were collected from 1981 to 1984.</p>
	<p>Eastern Oregon—The definition for old growth was adapted from Thomas (1979) as follows: at least 15 trees per acre that are at least 21 inches in d.b.h. or more than 160 years old, with at least one-half snag per acre larger than 21 inches in d.b.h. and 6.6 feet tall. Note that quaking aspen, lodgepole pine, and riparian hardwood types cannot be old growth. Data were collected from 1981 to 1984.</p>
	<p>Eastern Washington—Stands of trees 200 years and older are classified as old growth. Data were collected in 1980.</p>
	<p>Western Washington and western Oregon—Data for western Oregon were collected from 1984 to 1986. Data for western Washington were collected from 1988 to 1990. Old-growth definitions were adapted from the Old-Growth Definition Task Group (1986) for the plant communities listed below (see Ohmann 1992).</p>
	<p>Coniferous wetland, conifer-hardwood (outside southwest Oregon), temperate coniferous, or high-temperate coniferous communities require the presence of the following:</p>
	<ol style="list-style-type: none"> 1. At least eight live conifer trees per acre > 32 inches d.b.h. or > 200 years old. 2. At least 12 live conifer trees per acre of western hemlock, western redcedar, Pacific silver fir, or grand fir; or bigleaf maple trees that are 16 to 32 inches in d.b.h. 3. At least four conifer snags per acre 20 inches in d.b.h. or larger and at least 15 feet tall.

Evergreen hardwood communities require the presence of the following:

1. At least six live conifer trees per acre that are > 32 inches in d.b.h. or > 200 years old.
2. At least 12 trees per acre of any species that are 16 to 32 inches in d.b.h.
3. At least 1.5 conifer snags per acre that are > 20 inches in d.b.h. and > 15 feet tall.

Mixed-conifer and conifer-hardwood communities in southwest Oregon require the presence of the following:

1. At least eight live conifer trees per acre that are > 30 inches in d.b.h. or > 200 years old.
2. At least 12 live conifers trees per acre that are 15 to 30 inches in d.b.h.
3. At least 1.5 conifer snags per acre that are > 20 inches in d.b.h. and > 15 feet tall.

Tables 3 through 10 provide details about old-growth forest area by State and ownership.

Old-growth Area Tables

Table 3--Area of old-growth forests on reserved and unreserved lands by state and owner in California, Oregon, and Washington, 1992 ^a

State and owner	Reserved	Unreserved	Total
	<i>Acres</i>		
California:			
National Forests	164,000	487,000	651,000
National parks	480,990	0	480,990
Bureau of Land Management	200	0	200
State parks	77,500	0	77,500
State forests	0	5,360	5,360
Private, Native American	3,305	28,711	32,016
Other private lands	0	1,278,000	1,278,000
Total, California	725,995	1,799,071	2,525,066
Oregon:			
National Forests	729,121	3,606,836	4,335,957
National parks	50,480	0	50,480
Bureau of Land Management	244,000	120,000	364,000
State parks	9,550	0	9,550
State forests	--	--	--
Private, Native American	12,325	37,232	49,557
Other private lands	0	96,000	96,000
Total, Oregon	1,045,476	3,860,068	4,905,544
Washington:			
National Forests	619,694	1,335,894	1,955,588
National parks	693,000	0	693,000
Bureau of Land Management	--	--	--
U.S. Fish and Wildlife Service	300	0	300
State parks	8,873	0	8,873
State forests (DNR)	23,000	45,376	68,376
Private, Native American	29,693	33,602	63,295
Other private lands	0	49,000	49,000
Total, Washington	1,374,560	1,463,872	2,838,432
Total, all states	3,146,031	7,123,011	10,269,042

-- = No information is available for this ownership.

^a The date of compilation is 1992. Actual dates of classification range from the early 1980s to 1992.

Table 4--Area of old-growth forests on reserved and unreserved land by owner and state in California, Oregon, and Washington, 1992 ^a

Owner and State	Reserved	Unreserved	Total
<i>Acres</i>			
National Forests:			
California ^b	164,000	487,000	651,000
Oregon	729,121	3,606,836	4,335,957
Washington	619,694	1,335,894	1,955,588
Total, National Forests	1,512,815	5,429,730	6,942,545
National parks:			
California	480,990	0	480,990
Oregon	50,480	0	50,480
Washington	693,000	0	693,000
Total, National parks	1,224,470	0	1,224,470
Bureau of Land Management:			
California	200	0	200
Western Oregon	227,000	114,000	341,000
Eastern Oregon	17,000	6,000	23,000
Total, Bureau of Land Management	244,200	120,000	364,200
U.S. Fish and Wildlife Service:			
Washington (Willapa Bay)	300	0	300
State parks:			
California	77,500	0	77,500
Oregon	9,550	0	9,550
Washington	8,873	0	8,873
Total, state parks	95,923	0	95,923
State forests:			
California	0	5,360	5,360
Washington (DNR)	23,000	45,376	68,376
Total, state forests	23,000	50,736	73,736
Private:			
Native American--			
California	3,305	28,711	32,016
Oregon	12,325	37,232	49,557
Washington	29,693	33,602	63,295
Total, Native American	45,323	99,545	144,868
Other private--			
California	0	1,278,000	1,278,000
Oregon	0	96,000	96,000
Washington	0	49,000	49,000
Total, other private	0	1,423,000	1,423,000
Total, all owners	3,146,031	7,123,011	10,269,042

^a The date of compilation is 1992. Actual dates of classification range from the early 1980s to 1992.

^b Old-growth data are available for the Klamath province only, which includes the Klamath, Mendocino, Shasta-Trinity, and Six Rivers National Forests.

Table 5--Area of old-growth forests on reserved and unreserved lands in National Forests by state and National Forest in California, Oregon, and Washington, 1992 ^a

State and National Forest ^b	Reserved	Unreserved	Total
		<i>Acres</i>	
California:			
Klamath province only ^c	164,000	487,000	651,000
Oregon:			
Deschutes (lodgepole pine forests only)	16,300	48,100	64,400
Deschutes (forests without lodgepole pine)	82,200	201,500	283,700
Fremont (lodgepole pine forests only)	14,000	99,800	113,800
Fremont (forests without lodgepole pine)	6,000	430,000	436,000
Malheur	35,239	276,761	312,000
Mount Hood	52,000	293,300	345,300
Ochoco (western juniper forests only)	0	1,200	1,200
Ochoco (forests without western juniper)	20,500	73,300	93,800
Rogue River	22,044	76,573	98,617
Siskiyou	88,400	259,425	347,825
Siuslaw	2,000	31,800	33,800
Umatilla	68,850	121,891	190,741
Umpqua (mountain hemlock forests only)	38,900	43,300	82,200
Umpqua (forests without mountain hemlock)	30,900	422,200	453,100
Wallowa-Whitman	67,000	106,000	173,000
Willamette	100,800	494,000	594,800
Winema	83,988	627,686	711,674
Total	729,121	3,606,836	4,335,957
Washington:			
Colville	9,117	203,371	212,488
Gifford Pinchot	10,700	187,300	198,000
Mount Baker-Snoqualmie	232,500	411,000	643,500
Okanogan (lodgepole pine forests only)	95,000	95,000	190,000
Okanogan (forests without lodgepole pine)	76,900	49,100	126,000
Olympic	46,800	220,000	266,800
Wenatchee	148,677	170,123	318,800
Total	619,694	1,335,894	1,955,588
Total, all states	1,512,815	5,429,730	6,942,545

^a The date of compilation is 1992. Actual dates of classification range from the early 1980s to 1992.

^b National Forests are listed only where old-growth data are available.

^c These figures compare to a total productive forest land area of 4,105,000 acres that exists in the Klamath province--which includes the Klamath, Mendocino, Shasta-Trinity, and Six Rivers National Forests.

Table 6--Area of old-growth forests on reserved and unreserved lands managed by the National Park Service, by state and national park in California, Oregon, and Washington, 1992 ^a

State and national park, national monument, or national recreation area	Reserved	Unreserved	Total
	<i>Acres</i>		
California:			
Golden Gate National Recreation Area	8,100	0	8,100
Lassen Volcanic National Park	27,130	0	27,130
Lava Beds National Monument	570	0	570
Muir Woods National Monument	240	0	240
Redwood National Park	15,790	0	15,790
Sequoia/Kings Canyon National Park	202,430	0	202,430
Whiskeytown-Shasta-Trinity National Recreation Area	1,220	0	1,220
Yosemite National Park	225,510	0	225,510
Total	480,990	0	480,990
Oregon:			
Crater Lake National Park	50,000	0	50,000
Oregon Caves National Monument	480	0	480
Total	50,480	0	50,480
Washington:			
Mount Rainier National Park	91,000	0	91,000
North Cascades National Park	236,000	0	236,000
Olympic National Park	366,000	0	366,000
Total	693,000	0	693,000
Total, all states	1,224,470	0	1,224,470

^a The date of compilation is 1992. Actual dates of classification range from the early 1980s to 1992.

Table 7--Area of old-growth forests on reserved and unreserved lands in state parks by state and resource area or county, California, Oregon, and Washington, 1992^a

State, resource area or county, and state park	Reserved	Unreserved	Total
	<i>Acres</i>		
California:			
North Coast area--			
Admiral William Standley State Recreation Area	40	0	40
Annadel	574	0	574
Armstrong Redwood and Austin Creek	486	0	486
Bothe-Napa Valley	270	0	270
Del Norte Coast Redwoods	2,138	0	2,138
Grizzly Creek Redwoods	234	0	234
Harry A. Merlo State Recreation Area	150	0	150
Hendy Woods	506	0	506
Humboldt Redwoods	23,609	0	23,609
Jedediah Smith Redwoods	8,795	0	8,795
Maillard Redwoods	187	0	187
Mendocino Woodlands	700	0	700
Montgomery Woods State Reserve	914	0	914
Mount Tamalpais	752	0	752
Navarro Strip	600	0	600
Patrick's Point	100	0	100
Paul Dimmick	12	0	12
Prairie Creek Redwoods	10,084	0	10,084
Richardson Grove	642	0	642
Robert Louis Stevenson	-----No information available-----		
Russian Gulch	469	0	469
Salt Point	1,033	0	1,033
Samual P. Taylor	600	0	600
Sinkyone Wilderness	220	0	220
Smithe Redwoods State Reserve	14	0	14
Standish-Hickey State Recreation Area	21	0	21
Tomales Bay	1,400	0	1,400
Van Damme	1,850	0	1,850
Total	56,400	0	56,400
Central coast, interior, and southern California areas--			
Andrew Molera	100	0	100
Big Basin Redwoods	10,800	0	10,800
Burton Creek	150	0	150
Butano	150	0	150
Calaveras Big Trees	150	0	150
Calaveras South Grove National Preserve	1,260	0	1,260
Cuyamaca Mountain State Wilderness	2,000	0	2,000
D.L. Bliss	150	0	150
Edwin Z'Berg National Preserve	160	0	160
Forest of Nisene Marks	100	0	100
Henry Cowell Redwoods	200	0	200
Julia Pfeiffer Burns	50	0	50
Mount San Jacinto	5,000	0	5,000
Palomar Mountain	200	0	200
Pfeiffer Big Sur	100	0	100
Portola	300	0	300
San Simeon	50	0	50
South Yuba River Unclassified	100	0	100
Wilder Ranch	80	0	80
Total	21,100	0	21,100
Total, California State parks	77,500	0	77,500

Table 7--Area of old-growth forests on reserved and unreserved lands in state parks by state and resource area or county, California, Oregon, and Washington, 1992 ^a (continued)

State, resource area or county, and state park	Reserved	Unreserved	Total
			<i>Acres</i>
Oregon:			
Clackamas County--			
Milo McIver and county total	10	0	10
Clatsop County--			
Ecola	500	0	500
Feldenheimer	50	0	50
Oswald West	230	0	230
Saddle Mountain	500	0	500
Sunset Highway Wayside	30	0	30
Total	1,310	0	1,310
Columbia County--			
Sunset Highway Wayside and county total	10	0	10
Coos County--			
Cape Arago	10	0	10
Gold and Silver Falls	100	0	100
Maria C. Jackson	20	0	20
Total	130	0	130
Curry County--			
A.E. Loeb	100	0	100
Cape Sebastian	120	0	120
Carpenterville-B	10	0	10
Humbug Mountain	600	0	600
Port Orford Head	10	0	10
Sam Boardman	160	0	160
Total	1,000	0	1,000
Douglas County--			
Canyon Creek	10	0	10
Elk Creek Tunnel	150	0	150
Stage Coach	40	0	40
Umpqua River Wayside	30	0	30
Total	230	0	230
Hood River County--			
Seneca Fouts	150	0	150
Starvation Creek	50	0	50
Viento	70	0	70
Vince Lausmann	80	0	80
Wygant	150	0	150
Total	500	0	500
Jackson County--			
Jos. Steward	300	0	300
Tubb Springs	20	0	20
Total	320	0	320
Jefferson County--			
E.R. Corbett and county total	10	0	10

Table 7--Area of old-growth forests on reserved and unreserved lands in state parks by state and resource area or county, California, Oregon, and Washington, 1992^a (continued)

State, resource area or county, and state park	Reserved	Unreserved	Total
	<i>Acres</i>		
Oregon, continued:			
Josephine County--			
Illinois River	40	0	40
Makin Gulch	60	0	60
Stage Coach	100	0	100
Total	200	0	200
Lane County--			
Blachly Mountain	20	0	20
C.G. Washborne	90	0	90
Devils Elbow	40	0	40
H.J. Horton	10	0	10
J.M. Honeyman	40	0	40
Neptune	80	0	80
Washborne Wayside	10	0	10
Total	290	0	290
Lincoln County--			
H.B. Van Duzer	400	0	400
Rocky Creek	20	0	20
Total	420	0	420
Linn County--			
Cascadia and county total	100	0	100
Marion County--			
North Santiam	10	0	10
Silver Falls	1,990	0	1,990
Total	2,000	0	2,000
Multnomah County--			
Ainsworth	50	0	50
Bonneville	10	0	10
G. Joseph	50	0	50
G. Talbot	80	0	80
J.B. Yeon	150	0	150
McLoughlin	70	0	70
Shepperds Dell	50	0	50
Total	460	0	460
Tillamook County--			
Cape Lookout	600	0	600
Cape Meares	130	0	130
H. B. Van Duzer	410	0	410
Oswald West	1,400	0	1,400
Sunset Highway Forest Waysides	10	0	10
Total	2,550	0	2,550
Washington County--			
Sunset Highway Forest Waysides	10	0	10
Total, Oregon State parks	9,550	0	9,550

Table 7--Area of old-growth forests on reserved and unreserved lands in state parks by state and resource area or county, California, Oregon, and Washington, 1992^a (continued)

State, resource area or county, and state park	Reserved	Unreserved	Total
	<i>Acres</i>		
Washington:			
Island County--			
Fort Ebey	150	0	150
South Whidbey	83	0	83
Total	233	0	233
Kings County--			
Federation forest	618	0	618
Lewis County--			
Lewis and Clark	523	0	523
Rainbow Falls	120	0	120
Total	643	0	643
Pacific County--			
Fort Canby	1,390	0	1,390
San Juan County--			
Jones Island	179	0	179
Skagit County--			
Deception Pass	2,300	0	2300
Heart Lake	310	0	310
Hope Island	95	0	95
Rockport	455	0	455
Total	3,160	0	3,160
Snohomish County--			
Mount Pilchuck	1,800	0	1,800
Thurston County--			
Millersylvania	820	0	820
Yakima County--			
Fort Simcoe	30	0	30
Total, Washington State parks	8,873	0	8,873 ^b
Total, all states	95,923	0	95,923 ^b

^a The date of compilation is 1992. Actual dates of classification range from the early 1980s to 1992.

^b Excludes 35,485 acres of forest with scattered old-growth trees.

Table 8--Area of old-growth forests on reserved and unreserved land in state forests, California and Washington, 1992 ^a

State and forest or county	Reserved	Unreserved	Total
	<i>Acres</i>		
California ^b :			
State forests--			
Jackson	0	150	150
Mountain Home	0	3,200	3,200
LaTour Butte	0	2,000	2,000
Soquel	0	10	10
Total, California State forests	0	5,360	5,360
Washington ^c :			
State forest total by county--			
Callam	0	0	6,527
Clark	0	0	257
Cowlitz	0	0	1,198
Grays Harbor	0	0	711
Island	0	0	163
Jefferson	0	0	26,996
King	0	0	1,883
Kitsap	0	0	229
Kittitas	0	0	864
Klickitat	0	0	1,478
Lewis	0	0	1,651
Okanogan	0	0	1,045
Pacific	0	0	298
Pierce	0	0	378
Skagit	0	0	4,836
Skamania	0	0	1,052
Snohomish	0	0	15,098
Wahkiakum	0	0	96
Whatcom	0	0	3,616
Total, Washington State forests	23,000	45,376	68,376
Total, all states	23,000	50,736	73,736

^a The date of compilation is 1992. Actual dates of classification range from the early 1980s to 1992.

^b Data for California State forest land was provided at the forest level.

^c Data for Washington Department of Natural Resource land was provided at the county level. Breakdown of reserved and unreserved land is not available by county.

Table 9--Area of old-growth forests on reserved and unreserved privately owned lands (exclusive of Native American land) by state, 1992 ^a

State	Reserved	Unreserved	Total
<i>Acres</i>			
California:			
North coast	0	270,500	270,500
North interior	0	510,300	510,300
All other areas	0	497,200	497,200
Total	0	1,278,000	1,278,000
Oregon:			
Western	0	41,000	41,000
Eastern	0	55,000	55,000
Total	0	96,000	96,000
Washington:			
Western	0	30,000	30,000
Eastern	0	19,000	19,000
Total	0	49,000	49,000
Total, private lands	0	1,423,000	1,423,000

^a The date of compilation is 1992. Actual dates of classification range from the early 1980s to 1992.

Table 10--Area of reserved and unreserved old-growth forests on lands managed by the Bureau of Land Management by state and county or district, California and Oregon, 1992^a

State and county or district	Reserved	Unreserved	Total
		<i>Acres</i>	
California:			
Humboldt County	200	0	200
Western Oregon:			
Coos Bay district	39,000	8,000	47,000
Eugene district	33,000	4,000	37,000
Medford district	49,000	48,000	97,000
Roseburg district	81,000	47,000	128,000
Salem district	25,000	7,000	32,000
Total	227,000	114,000	341,000
Eastern Oregon:			
Lakeview district	1,000	6,000	7,000
Other districts	16,000	0	16,000
Total	17,000	6,000	23,000
Total, all states	244,000	120,000	364,000

^a The date of compilation is 1992. Actual dates of classification range from the early 1980s to 1992.

Terminology

Bureau of Land Management (BLM)—An ownership class of Federal lands administered by the Bureau of Land Management, U.S. Department of the Interior.

Diameter class—A classification of trees based on diameter outside bark measured at breast height (4-1/2 feet aboveground). The common abbreviation for “diameter at breast height” is d.b.h. With 2-inch diameter classes, the 6-inch class, for example, includes trees 5.0 through 6.9 inches d.b.h., inclusive.

Department of Natural Resources—A department within the State of Washington responsible for managing State-owned forest land.

Hardwood—A dicotyledonous tree that usually is broad-leaved. Hardwoods can be deciduous or evergreen.

National Forest (NF)—An ownership class of Federal lands, designated by Executive Order or statute as National Forests or purchase units, and other lands under the administration of the Forest Service including experimental areas and Bankhead-Jones Title III lands.

Native American—An ownership class that includes tribal lands held in fee by the Federal Government, but administered for Indian tribal groups and Indian trust allotments.

National parks—Federal lands administered by the U.S. Department of the Interior, National Park Service.

Old growth—A classification of forest stands that describes an ecologically mature ecosystem. Where information is not available for ecological classification, age or size of dominant trees, or both, are used.

Private lands—Land owned by individuals or private corporations.

Productive forest land—In general, forest land capable of producing 20 cubic feet or more per acre per year of industrial wood. On some lands, especially wilderness and parks, this does not apply because the productive capacity has not been determined. Includes reserved and unreserved land.

Reserved—Land that is withdrawn from timber utilization by statute or administrative regulation.

Softwood—A coniferous tree, usually evergreen, having needles or scalelike leaves.

State forests—Forested land owned and managed by state governments.

State parks—Land that has been set aside by state governments, and withdrawn from forest management by statute, ordinance, or policy.

Timberland—Forest land capable of producing 20 cubic feet of volume per acre per year of industrial wood and is unreserved (not withdrawn from timber utilization by statute or administrative regulation).

Unreserved land—Land that is not withdrawn from use by statute or administrative regulation. For example, in National Forests, unreserved land includes areas managed for timber production.

Names of Trees

Common name

Scientific name

Softwoods:

True firs	<i>Abies</i> sp. Mill.
Pacific silver fir	<i>Abies amabilis</i> Dougl. ex Forbes
White fir	<i>Abies concolor</i> (Gord. & Glend.) Lindl. ex Hildebr.
Grand fir	<i>Abies grandis</i> (Dougl. ex D. Don) Lindl.
Subalpine fir	<i>Abies lasiocarpa</i> (Hook.) Nutt.
Noble fir	<i>Abies procera</i> Rehd.
California red fir	<i>Abies magnifica</i> A. Murr.
Alaska yellow cedar	<i>Chamaecyparis nootkatensis</i> (D. Don) Spach
Western larch	<i>Larix occidentalis</i> Nutt.
Incense-cedar	<i>Libocedrus decurrens</i> Torr.
Engelmann spruce	<i>Picea engelmannii</i> Parry ex Engelm.
Jeffrey pine	<i>Pinus jeffreyi</i> Grev. & Balf.
Sugar pine	<i>Pinus lambertiana</i> Dougl.
Ponderosa pine	<i>Pinus ponderosa</i> Dougl. ex Laws.
Douglas-fir	<i>Pseudotsuga menziesii</i> (Mirb.) Franco
Redwood	<i>Sequoia sempervirens</i> (D. Don) Endl.
Western redcedar	<i>Thuja plicata</i> Donn ex D. Don
Western hemlock	<i>Tsuga heterophylla</i> (Raf.) Sarg.
Mountain hemlock	<i>Tsuga mertensiana</i> (Bong.) Carr.

Hardwoods:

Bigleaf maple	<i>Acer macrophyllum</i> Pursh
Pacific madrone	<i>Arbutus menziesii</i> Pursh
Giant chinkapin	<i>Castanopsis chrysophylla</i> (Dougl.) A. DC.
Tanoak	<i>Lithocarpus densiflorus</i> (Hook. & Arn.) Rehd.
Canyon live oak	<i>Quercus chrysolepis</i> Liebm.
Oregon white oak	<i>Quercus garryana</i> Dougl. ex Hook.
California black oak	<i>Quercus kelloggii</i> Newb.
California-laurel	<i>Umbellularia californica</i> (Hook. & Arn.) Nutt.

Acknowledgments

We thank the following people for their help and contributions to the information presented in this report:

Mike Srago and Ralph Warbington, USDA Forest Service, Pacific Southwest Region, San Francisco, CA.

Robert G. Lewis and John Teply, USDA Forest Service, Pacific Northwest Region, Portland, OR.

James W. Larson and Kathy Jope, U.S. Department of the Interior, National Park Service, Seattle, WA.

Alan Schmierer, U.S. Department of the Interior, National Park Service, San Francisco, CA.

Bob Ruesink and Barry Mulder, U.S. Fish and Wildlife Service, Portland, OR.

Larry Fox, Humboldt State University, Arcata, CA.

Don Preston, U.S. Department of the Interior, Bureau of Land Management, Portland, OR.

Brian Barrette, Gary Brittner, and Janine Stenbeck, California Department of Forestry and Fire Protection, Sacramento, CA.

Lyann Comrack, Stephen Bakken, Michael Swezy and Rick Rayburn, California Department of Parks and Recreation, Sacramento, CA.
 Al Tocchini and Margie Willis, Oregon State Parks, Salem, OR.
 Terry Patton, Washington State Parks, Olympia, WA.
 Glenn Yeary, Washington Department of Natural Resources, Olympia, WA.
 Debra Naslund, Natural Heritage Department, Olympia, WA.
 Jack Biondini, Hoopa Valley Reservation, Hoopa, CA.
 Ken Lathrop, Cay Ogden, and Arnie Browning, Bureau of Indian Affairs, Portland, OR.
 Dave Stere, Oregon Department of Forestry, Salem, OR.
 Doug Miller, California State Lands Commission, Sacramento, CA.
 Mark Hoshovsky, California Natural Diversity Data Base, Sacramento, CA.
 Dean Angelides, VESTRA, Sacramento, CA.

Literature Cited

- Andrews, H.J.; Cowlin, R.W. 1940.** Forest resources of the Douglas-fir region. Misc. Publ. 389. Washington, DC: U.S. Department of Agriculture, Forest Service. 169 p.
- Barbour, Michael G.; Major, Jack. 1977.** Terrestrial vegetation of California. New York: Wiley and Sons. 1002 p.
- Bolsinger, Charles L. 1973.** Changes in commercial forest area in Oregon and Washington, 1945-70. Resour. Bull. PNW-46. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 19 p.
- Bolsinger, Charles L. 1980.** California forests: trends, problems, and opportunities. Resour. Bull. PNW-89. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 138 p.
- Brubaker, Linda B. 1991.** Climate change and the origin of old-growth Douglas-fir forests in the Puget Sound lowland. In: Ruggiero, Leonard F.; Aubrey, Keith; Carey, Andrew; Huff, Mark, tech. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 17-24.
- Cowlin, R.W.; Briegleb, P.A.; Moravets, F.L. 1942.** Forest resources of the ponderosa pine region of Washington and Oregon. Misc. Publ. 490. Washington, DC: U.S. Department of Agriculture, Forest Service. 99 p.
- Fox, Lawrence. 1988.** A classification, map and volume estimate for the coast redwood forests in California. Arcata, CA: Department of Forestry, College of Natural Resources, Humboldt State University. 41 p.
- Franklin, J.; Cromack, F., Jr.; Denison, W. [and others.] 1981.** Ecological characteristics of old-growth Douglas-fir forests. Gen. Tech. Rep. PNW-118. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 48 p.
- Hansen, Henry P. 1946.** Postglacial forest succession and climate in the Oregon Cascades. American Journal of Science. 244: 710-734.
- Haynes, Richard W. 1986.** Inventory and value of old-growth in the Douglas-fir region. Res. Note PNW-437. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 19 p.

- Holthausen, Richard S.; Marcot, Bruce G. 1991.** Applying the results of old-growth research to management: information needs, development of technical tools, and future research. In: Ruggiero, Leonard F.; Aubrey, Keith; Carey, Andrew; Huff, Mark, tech. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 463-470.
- MacLean, Colin D. 1990.** Changes in area and ownership of timberland in western Oregon: 1961-86. Resour. Bull. PNW-RB-170. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 13 p.
- MacLean, Colin D.; Bassett, Patricia M.; Yeary, Glenn. 1992.** Timber resource statistics for western Washington. Resour. Bull. PNW-RB-191. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 135 p.
- Marcot, Bruce G.; Holthausen, Richard S.; Teply, John; Carrier, W. Dean. 1991.** Old-growth inventories: status, definitions, and visions for the future. In: Ruggiero, Leonard F.; Aubrey, Keith; Carey, Andrew; Huff, Mark, tech. coords. Wildlife and vegetation of unmanaged Douglas-fir forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 47-60.
- Ohmann, Janet L. 1992.** Wildlife habitats of the north coast of California: new techniques for extensive forest inventory. Res. Pap. PNW-RP-440. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 48 p.
- Old-Growth Definition Task Group. 1986.** Interim definitions for old-growth Douglas-fir and mixed-conifer forests in the Pacific Northwest and California. PNW-447. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 7 p.
- Schofield, W.B. 1969.** Phytogeography of northwestern North America: bryophytes and vascular plants. *Madrono*. 20(3): 155-207.
- Thomas, Jack Ward, ed. 1979.** Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. Agric. Handb. 553. Washington, DC: U.S. Department of Agriculture. 512 p.
- Tyrell, Lucy E. 1991.** Old-growth forests on National Park Service lands: NPS views and information. Great Lakes CPSU Rep. 91-1. Madison, WI: Department of Botany, University of Wisconsin. 54 p.
- U.S. Department of Agriculture, Forest Service. 1989.** An analysis of the land base situation in the United States: 1989-2040. Gen. Tech. Rep. RM-181. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 38-49.

Bolsinger, Charles L.; Waddell, Karen L. 1993. Area of old-growth forests in California, Oregon, and Washington. Resour. Bull. PNW-RB-197. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 26 p.

Area of old-growth forests in California, Oregon, and Washington has declined significantly in the second half of the 20th century. This report summarizes available information on old-growth forest area by ownership in California, Oregon, and Washington. Old-growth definitions used by the various owners and agencies are provided.

Keywords: Old growth, inventory, forest stands, forest area, California, Oregon, Washington.

The **Forest Service** of the U.S. Department of Agriculture is dedicated to the principal of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

The U.S. Department of Agriculture is an Equal Opportunity Employer. Applicants for all Department programs will be given equal consideration without regard to age, race, color, sex, religion, or national origin.

Pacific Northwest Research Station
333 S.W. First Avenue
P.O. Box 3890
Portland, Oregon 97208-3890

U.S. Department of Agriculture
Pacific Northwest Research Station
333 S.W. First Avenue
P.O. Box 3890
Portland, OR 97208

Official Business
Penalty for Private Use, \$300

do NOT detach label